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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/071,424	02/08/2002	Lieuwe Jan Spreeuwers	NL010107	1725

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EXAMINER	
KRONENTHAL, CRAIG W	

ART UNIT	PAPER NUMBER
2623	

DATE MAILED: 02/01/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/071,424	SPREEUWERS ET AL.	
	Examiner	Art Unit	
	Craig W Kronenthal	2623	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *08 February 2002*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-17* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-17* is/are rejected.

7)☒ Claim(s) *10* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *08 February 2002* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *08/21/03*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Claim Objections

1. Claim 10 is objected to because of the following informalities:

- On line claim 2 in claim 10, "regions of interest is localized" should be replaced with "regions of interest are localized".

Appropriate correction is required.

2. A series of singular dependent claims is permissible in which a dependent claim refers to a preceding claim which, in turn, refers to another preceding claim. A claim which depends from a dependent claim should not be separated by any claim which does not also depend from said dependent claim. It should be kept in mind that a dependent claim may refer to any preceding independent claim. In general, applicant's sequence will not be changed. See MPEP § 608.01(n).

Claims 13-15 should be placed after claim 3 and before claim 5.

Claim Rejections - 35 USC § 102

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

4. Claims 1 are rejected under 35 U.S.C. 102(b) as being anticipated by Gupta et al. (PN 6,292,683). (hereinafter Gupta)

Regarding Claim 1: Gupta discloses a method of analyzing successive data sets, in which method:

- The individual data sets comprise data elements which assign data values to spatial positions (col. 7 lines 9-10). [The MR images represent the data sets, and the assigned data values to spatial positions correspond to the intensities of the MR images.]
- A local intensity variation [I(x,t)] is established from data values in successive data sets in corresponding spatial positions (col. 7 lines 10-14). [The local intensity variation is computed by matching intensities of corresponding successive MR images.]
- On the basis of the local intensity variation a region of interest is localized from one or more of the successive data sets (col. 7 lines 24-27). [The algorithm iterates through successive MR images, computing the correlation coefficients of patterns to determine a region of interest.]
- The local intensity variation in the region of interest is in conformity with a predetermined property (col. 7 lines 10-11). An initial reference are used to obtain the patterns, which were correlated with the successive MR image intensities to compute the correlation coefficients.]

The analogous arguments of claim 1 are applicable to claims 16 and 17.

Regarding Claim 2: Gupta discloses a method of analyzing successive data sets as claimed in claim 1, in which the local intensity variation is established for respective blocks of several data elements (col. 7 lines 12-14). [The patterns are a group of pixel values (also intensities) used for matching and therefore represent the blocks of several data elements.]

Regarding Claim 3: Gupta discloses a method of analyzing successive data sets as claimed in claim 1, in which method:

- The region of interest is localized on the basis of variations in the local intensity variation, notably on the basis of a time derivative of the local intensity variation (col. 8 lines 40-47). [The region of interest is localized by choosing the pattern that meets the tolerance requirements. The tolerance may be a predetermined velocity, which is the first time derivative. Therefore the velocity would be determined for each pattern and only those patterns meeting the tolerance requirements belong to the region of interest.]

Regarding Claim 4: Gupta discloses a method of analyzing successive data sets as claimed in claim 3, in which method:

- The region of interest is localized by localizing blocks of data elements in which the variations in the local intensity variation are larger than a predetermined ceiling value and/or by localizing blocks of data elements in which the variations in the local intensity variation are smaller than a predetermined bottom value (col.

8 lines 46-47). [The tolerance explained regarding claim 3 is the predetermined ceiling/predetermined bottom value.]

Regarding Claim 5: Gupta discloses a method of analyzing successive data sets as claimed in claim 1, in which method:

- Data elements are classified in one or more individual data sets (col. 8 lines 28-31 and line 40). [The two sets are the accepted set or rejected set.]
- The classification of the data elements in the relevant data set (sets) indicating whether the relevant data element belongs to the region of interest or not (col. 8 lines 28-39 and/or lines 45-47). [The pattern and its inclusive pixels are classified (either accepted or rejected) based on a comparison of the pattern correlation coefficient and a threshold (lines 28-39). Another method of classifying is based on the relationship of the calculated velocity of the pattern to the predetermined tolerance it is determined whether or not the pattern is accepted to the region of interest or rejected from the region of interest (lines 45-47).]

Regarding Claim 6: Gupta discloses a method of analyzing successive data sets as claimed in claim 5, in which method the classification is performed on the basis of a measure of similarity of the local intensity variation and a reference intensity variation in the region of interest (col. 8 lines 2-6). [The correlation coefficient represents the measure of similarity. The pixels accepted to the region of interest are those with the

highest correlation coefficients, while those rejected have too low of a correlation coefficient.]

Regarding Claim 7: Gupta discloses a method of analyzing successive data sets as claimed in claim 5, in which method the classification is performed on the basis of a correlation of the local intensity variation with a mean intensity variation in the region of interest (col. 7 lines 49-50). [As explained regarding claim 6 the classification is based on the correlation coefficients. The correlation coefficients are calculated on the basis of correlating regions of interest using a function of the mean intensity variation.]

Regarding Claim 9: Gupta discloses a method of analyzing successive data sets as claimed in claim 1, in which the successive data sets are made to correspond to one another (col. 6 lines 31-38). [The successive data sets or MR images are registered so that the spatial intensities of one image correspond to the spatial intensities of the following image.]

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

6. Claim 8 is rejected under 35 U.S.C. 103(a) as being unpatentable over Gupta in view of Doi et al. (PN 5,343,390). (hereinafter Doi)

Regarding Claim 8: Gupta discloses a method of analyzing successive data sets as claimed in claim 1, but does not disclose masking the data values based on spatial gradients. However, Doi discloses an method automated method for selecting a region of interest from medical images in which method parts with spatial gradients of data values are masked in individual data sets in as far as the modulus of the spatial gradients in the relevant parts exceeds a predetermined acceptable gradient modulus (col. 8 lines 19-24). [Doi discloses an edge gradient analysis in which gradient values of blocks within an image are compared with a predetermined threshold to mask the region of interest. It would be obvious to one of ordinary skill in the art to modify Gupta with Doi because Doi teaches the importance of eliminating sharp edges in MR imaging. Furthermore one of ordinary skill in the art would be motivated to eliminate sharp edges to reduce the number of falsely identified regions of interest due to temporary gradients.

7. Claims 10-12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Geiser et al. (PN 5,797,396). (hereinafter Geiser (5,797,396)).

Regarding Claim 10: Gupta discloses a method of analyzing successive data sets, in which method:

- A plurality of regions of interest is [are] localized on the basis of the local intensity variation the local intensity variation in said regions of interest being in conformity with a predetermined property

Gupta does not disclose obtaining the MIPs or obtaining a feature image from differencing MIPs. However, Geiser (5,797,396) does disclose:

- Maximum intensity projections (MIPs) are determined for the respective regions of interest (col. 9 lines 19-27). [The "circular arc" filter is used to obtain only the maximum intensities of the region of interests. The region of interests are the points found on each radii of different length.]
- A feature image is formed from differences between said maximum intensity projections (col. 9 lines 40-42). [The maximum intensities found on one size radius are subtracted from the maximum intensities of the next sized radius forming the 33 radii.]

It would be obvious to one of ordinary skill in the art to modify Gupta with the teaching of Geiser (5,797,396) because both teach automatic methods of determining a region of interest, specifically in the area of the myocardium, from medical images. Furthermore, one would be motivated to incorporate Geiser's (5,797,396) MIPs into Gupta's method of detecting a region of interest to eliminate intensities caused by blood vessels and other interfering small structures that might be confused with parts of the structure of interest.

Regarding Claim 11: Gupta in view of Geiser (5,797,396) disclose a method of analyzing successive data sets as claimed in claim 10. Geiser (5,797,396) further discloses the method in which method a center of the region of interest is determined in the feature image (col. 9 lines 64-67). [Geiser (5,797,396) determines a center-point of the left ventricle, which is the region of interest in this instance.]

Regarding Claim 12: Gupta in view of Geiser (5,797,396) disclose a method of analyzing successive data sets as claimed in claim 11. Geiser (5,797,396) further discloses the method in which method:

- The feature image is transformed to pole-coordinates (col. 24 lines 1-2) with said center as the origin (col. 19 lines 34-35). [The polar image is formed at step 220 (Fig. 14). Also the elliptical arc which represents the feature image is centered on the origin.]
- A boundary of the region of interest is localized in said transformed feature image. [The examiner takes official notice that the boundary of a region of interest can be determined in polar coordinates.]

8. Claims 13-15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Geiser et al. (PN 5,360,006). (hereinafter Geiser (5,360,006))

Regarding Claim 13: Gupta discloses a method as claimed in claim 3. But Gupta does not disclose the creation of a mask from the time derivative. However, Geiser (5,360,006) discloses a method in which method:

- A mask is derived from the time derivative of the local intensity variation for an individual data set (col. 14 lines 18-21). [Each histogram represents the local intensity variation of its respective data set. The mask is the peak data resulting from cross-correlating the first derivative histograms, which represent the first time derivative of the local intensity variation.]
- The region of interest is segmented from the relevant data set by means of the mask (col. 14 lines 21-28). [The correlation results may generate a peak, which is used to estimate the location of the borders. This estimation of the location represents a region of interest.]

Regarding Claim 14: Gupta in view of Geiser (5,360,006) discloses a method as claimed in claim 13. Geiser (5,360,006) discloses a method in which method the mask is derived by applying a threshold filter to the time derivative of the local intensity variation for the relevant data set (col. 14 lines 21-24). [The correlation results are search for a peak. It is inherent that this process is a function of a peak detector, which is a type of filter that utilizes a threshold.

Regarding Claim 15: Gupta discloses a method as claimed in claim 3. Gupta does not disclose a spatial distribution of the time derivative. However, Geiser (5,360,006) does

disclose a method in which method a spatial distribution of the time derivative of the local intensity variation is reproduced for an individual data set (col. 14 lines 58-62). [The spatial distribution of the time derivative is represented by an individual power curve. Figure 5 shows eight different power curves for their eight respective individual data sets.]

Conclusion

9. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

- Sheehan et al. (PN 5,734,739) is cited for teaching the use of intensity variation of temporal medical images to determine the boundaries of an organ, specifically the left ventricle.
- Sheehan et al. (PN 5,570,430) is cited for teaching the use of intensity variation of temporal medical images to determine the boundaries of an organ, specifically the left ventricle.
- Hsieh (PN 6,278,767) is cited for teaching the use of MIP images to identify the object of interest and its respective boundaries and center.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Craig W Kronenthal whose telephone number is (703) 305-8696. The examiner can normally be reached on 8:00 am - 5:00 pm / Mon. - Fri..

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Amelia Au can be reached on (703) 306-6604. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

01/24/05
CWK

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